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ART. I.—THE CREMASTER-REFLEX.

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IN 1864 my attention was first called to the reflex movements of the cremaster muscles by a case in which a bullet wound of the inside of the thigh and of the sciatic nerve, caused retraction of the testicle for several hours.

In 1872, in my work on "Nerve Injuries," p. 137, I mentioned this case and briefly described the cremaster-reflex and the region of skin capable of producing it.

Within a year I have more carefully re-studied the subject with the hope of finding new and useful diagnostic help in cases of spinal disease. I have been disappointed in attaining valuable results in this direction, but I have learned enough that is curious and physiologically interesting to make it worth while to state with brevity the results of my observations.

The muscle slips which constitute the cremaster are portions of the lower edge of the belly of the internal oblique muscle and transversalis. The reflex arc arises on one hand in the skin of a large part of the thigh by twigs of the anterior

crural, internal cutaneous, middle cutaneous, two saphenous, and anterior twig of obturator.

Through the lumbar enlargement of the cord the arch is completed by means of the *genital branch* of the genito-crural trunk, which innervates the cremaster.

In boys the cremaster muscle acts in many cases rhythmically with the other abdominal muscles, so that the testicles rise during inspiration and fall during expiration, as occurs in the ram, the goat, and the dog, in which animals section of the cord arrests this movement.* A like rhythmical activity is sometimes seen in adults, but usually it is lost before the age of twenty. Most young lads and many adults enjoy voluntary power to raise the two testicles at once, and a few persons can at will elevate either testicle singly.

In very few, however, even of the young, is the control of the will equal over both testicles. One rises quicker or more completely than the other, and nearly always one hangs lower than the other at all times.

The cremaster-reflex I described simply in 1872 as capable of being awakened by a touch or pinch of a definite region of the thigh extending from the groin nearly to the knee. Jastrowsky in 1875 describes this reflex as arising on irritations of the inner side of the thigh, and that it is best obtained in the area of the saphena major nerve about a hand's breadth above the internal condyle in the notch between the inner border of the sartorius and the vastus internus. Rosenbach's and Hinze's papers I have been unable to obtain, and do not know how far these authors have studied the limits of this reflex. According to very careful observations made by Drs. Sinkler, Alison, and myself, the region within which we are capable of causing cremaster movement when the skin is touched or pinched is quite extensive in a lad of six to ten years, in whom it is best seen. To learn its limits the observer must bear in mind that certain precautions are necessary. As the scrotum acts at once in a cold atmosphere, and by drawing up the gland obscures the results of cremaster motion, it is

* Jastrowsky, *Berlin. klin. Wochenschrift*, Aug., 1875. "On Cremaster-Reflex."

well to examine the phenomena when the parts are relaxed and pendant, in a warm room, and this is especially needful in young and strong adults in whom the scrotal purse acts well and steadily.

It is also desirable to make the examination so as not to tire the muscle or exhaust the centres, as happens in adults more than in boys. In young lads the cremaster-reflex is easily caused by touching or pinching the whole thigh, with the exception of a band of skin which nearly always may be represented as forming the postero-lateral third of the circumference of the thigh. Within this area no touch or pinch causes cremaster reflex until as we approach the edge of the imaginary boundary, it begins to show and increases as we come around the thigh, until we enter a band of excessive sensitiveness. This region, bounded by the groin and perinæum, is broad above and narrows below, and ceases at or below the knee. Within this area, according to Jastrowsky, lies a limited and most sensitive region. I think him wrong, however, as to this being *always* the most excitable region, since in many people—boys as well as adults—the best cremaster-reflex is had from irritations addressed to parts on the inner aspect of the thigh, and very high up.

These, then, are the usual limits of the cremaster-reflex region, although it is sometimes far less and sometimes far more extensive; but extreme limitations of its area are more apt to occur in adults. When least extensive in the healthy boy it is found to cover the inner third of the thigh, and to cease anteriorly near the middle line of the front of the thigh, and also to fail us above the knee. When largest, it covers the lower third of the belly, all of the space first mentioned by me as its usual territory, and descends down the inside of the leg—over a space which narrows as it goes down, and sometimes includes a large part of the calf of the leg.

In adults, as I have said, the excitor region becomes more restricted. When smallest it occupies a space on the inner thigh, which is broad above and sometimes begins at the line of the perinæum, and sometimes a little below—is irregular in shape, but commonly narrows below and ends above the inner side of the knee. In a few people the excitor region is

even less than this, and in numbers of adults it does not exist at all. Jastrowsky thinks that cremaster-reflex is apt to be lost in the fat. I am sure that in old age it is diminished, or even destroyed, and that something in adult life, perhaps the constant contact of our clothes, lessens its activity—as I have never seen it absent in the young, and have many times seen none in vigorous adults.

Wearing of trusses, old hernia, and extreme cases of varicocele, all lessen or destroy it, and as a rule, though not a constant one, when the cremaster-reflex is absent the volitional control is feeble or absent; while on the other hand, a very few healthy people who move the testicles easily by will have no cremaster-reflex.

It is, I think, most remarkable that the excitor region, never, as far as I have seen, includes the scrotum or penis.

I am quite well satisfied that the cremaster-reflex varies from day to day in the same region. I mean that it varies not only as to intensity, but even in some persons as to its existence, and for this there may be some easily conceivable causes. I shall also be able to show that it exhibits like variations in some cases of disease.

The readiness of the reflex response differs also in different persons. In boys the least touch anywhere in the excitor region causes an instantaneous and very complete movement of the testicle, which remains drawn up as long as the irritations are repeated. It is in fact very difficult in the young to wear out the power of reflex response. In the mature adult, however, the cremaster movements are more tardy and less complete, and in some persons there is no movement when we merely touch the skin—a decided pinch of the irritable region being needed to cause motion of the testicle. In the grown man having a good capacity of reflex-cremaster motion, when we pinch or touch the skin, at first the testicle rises well, but as we continue to excite the same space, the cremaster responds more and more feebly until at last it entirely ceases to move, no matter how severely the skin be irritated. If now we touch or pinch the skin an inch or two away, the testicle is again drawn up, thus showing that we have worn out the capacity of the skin nerves and not that of the motor centre

or of the muscle itself. Returning in a few minutes to the exhausted area we find it again capable of evoking cremaster motion. In others, the first effort to produce the cremaster-reflex totally fails, and it is only after a number of repetitions of the excitation that we succeed in bringing about movement of the testicle.

As a rule which has infrequent exceptions, irritation of one side produces unilateral movement of the testicle of the same side. There are two forms of violation of this law. In the first, irritation of one thigh causes motion of the testicle of the same side and also, a moment later, less complete action on the testicle of the opposite side. In the other case, touching or pinching certain parts of the inner and usually the lower half of the thigh causes reflex-cremaster motion on the other side only; while like irritations in other parts higher up give rise only to unilateral activity on the same side.

The above statements sum up briefly all that I have been able to learn in regard to the normal cremaster-reflex. The extreme irregularity and uncertainty of this reflex in health, prepares us to find that it is of very little value in disease, and so far as I have carried my studies they but serve to illustrate this view. Jastrowsky—op. cit.—says that in hemiplegia there is sometimes no cremaster-reflex on either side during the stupor, but usually, on the day after attack, there is no motion on the hemiplegic side, and increased cremaster-reflex on the sound side—or rarely—irritation of the palsied side gives rise to crossed reflex, which lessens as the palsy improves, but may last for years. If, then, the palsied side becomes hyperæsthetic the reflex relations are apt to be reversed and the lame cremaster acts best.

Hinze (*St. Petersb. Med. Wochenschrift*, No. 35, 1876) quotes Rosenbach (*Arch. f. Psych.*, VI., 845), to the effect that in 10 cases of hemiplegia cremaster-reflex and adominal-reflex were absent on the paralyzed side. The ages are not given. Of his own 21 cases the cremaster-reflex was absent in 18.

My own observations correspond in substance with these. In four cases of recent and very decided hemiplegia, the cremaster-reflex was lost on the palsied side during the first few weeks.

I have met with the following cases of this palsy exhibiting a crossed reflex :

Mr. L., æt. 60, had a right hemiplegia which has so far recovered that he remains slightly lame in arm and leg. The tendon-reflex is very good. The cremaster-reflex excellent on both sides, but a sharp pinch of the left inner side of the thigh causes first a good response from the left cremaster, and about two to three seconds later a slower but complete movement of the right testicle. No other than a limited region of skin gave rise to this phenomenon—which may have been a normal peculiarity.

No. 1, æt. 42, left hemiplegia from embolism; no hemianæsthesia; cremaster-reflex, right, very good; cremaster-reflex, left, good reaction of both cremasters to touch of thigh. When the irritation is frequently repeated the left cremaster ceases to respond and the right still moves well, but a sharp pinch of left thigh again gives rise to bilateral cremaster action. Pinch of left knee inside, and of inner side left calf, causes left cremaster alone to move.

No. 2. Syphilis; albuminuria; right hemiplegia, complete; nearly perfect recovery; no hemianæsthesia; cremaster-reflex, right, good; cremaster-reflex, left, good on upper inner side of thigh for touch and pinch. The same excitations of lower third of inner thigh give rise to bilateral cremaster movement.

No. 3 is a very curious case, and is the only one on record, as yet known to me, of clonic convulsive movements of the cremaster. It will induce me to ask attention to the condition of this muscle in epileptic spasms.

The patient, a man æt. 72, a sea captain, had mitral disease and indurated arteries. I saw him in consultation with Dr. Betts. He was attacked March 17 with left hemiplegia, which, although complete, became rapidly better. March 24, he could move the leg and arm freely. At 4 A. M., he was seized with loss of consciousness, but without any new motor disturbance and without convulsion. When seen by me, at 3 P. M., he was moving all his limbs uneasily. He felt a pinch and showed annoyance in his face. He swallowed well but lay most of the time with closed eyes, the pupils sensitive to light and equal in size.

Cremaster-reflex, right, good, to touch. A pinch caused bilateral cremaster movement tardily on left. At intervals the left cremaster muscle exhibited a singular state of incessant motion. The testicle was drawn up, then fell, then rose and fell rapidly, while the right remained at rest. The cremaster in the belly-wall could be seen to be in almost constant motion, and the lower third of the abdominal wall was also twitching with some slighter display of like movements in the anterior face of the upper fourth of the left thigh. The urine dribbled away from an empty bladder.

PARALYSIS OF INFANCY.

E. S., æt. 3.—Two years' duration. Limited to right leg. There is some slight atrophy of the thigh muscles, but E. S. can move usefully all the leg and thigh muscles, although the triceps has not full power. Tendon-reflex perfect right and left; cremaster-reflex very good over an unusually large area of skin.

H. E., æt. 7.—Four years' duration. Complete loss of power to extend right thigh; with great wasting; can extend and flex foot; left leg sound; tendon-reflex, right, absent; tendon-reflex, left, good; cremaster-reflex, right, good; cremaster-reflex, left, good, and is accompanied with crossed reflex.

J. T., æt. 6.—Paralysis with atrophy of right leg for one year. The thigh muscles move well and are but little wasted; the leg muscles are completely palsied; tendon-reflex was not studied by the observer; cremaster-reflex, right and left, good.

J. M., æt. 6.—Palsy for five years. Left leg only affected; atrophy of thigh and leg muscles (extensors); cannot extend leg or foot at all; muscles of calf partially palsied; plantar reflex, good; tendon-reflex, absent, right and left; cremaster-reflex, absent, right and left.

W. McC., æt. 4.—Palsied two and a half years. General palsy at first and limited to right leg in five weeks; no muscular power in right leg or thigh, save just to stir the toes; leg wasted; tendon-reflex, absent, right and left; cremaster-reflex, absent, right; cremaster-reflex, slight, left.

The cremaster-reflex was studied in four cases of incomplete paraplegia, with more or less spastic contractions of the muscles.

THE ERB-CHARCOT GROUP.

No. 1, æt. 42.—Typical case of the Erb and Charcot symptom-group, with extreme tendon-reflex in many situations; the cremaster-reflex, right, a trace; cremaster-reflex, left, none.

No. 2, æt. 43.—Well marked case. Tendon-reflex exaggerated; cremaster-reflex, right, good—not unusual; cremaster-reflex, left, good, and accompanied by crossed reflex, *i. e.*, left thigh irritation gives bilateral cremaster-reflex.

No. 3, æt. 70.—Typical case of old spastic paraplegia, with convulsive actions in legs on irritation of soles. Exaggerated and violent tendon-reflex; cremaster-reflex, none right or left.

No. 4, æt. 56.—Posterior sclerosis, complicated as it advanced with rigidity of legs; tendon-reflex, exaggerated; cremaster-reflex, right, a trace; cremaster-reflex, left, a trace.

No. 5, a man æt. 60. Much loss of sensation; general wasting of legs; lessening power; feeble bladder; no eye lesions; no neuralgia; staggers with closed eyes; slight rigidity; tendon-reflex exaggerated; cremaster-reflex entirely absent; abdominal-reflex, absent; plantar-reflex, excessive.

The latter case carries us into the ataxias.

There were studied ten cases of well marked posterior sclerosis—none of them in the paralytic stage.

No. 1, æt. 47.—Old case—has lasted 15 years. Tendon-reflex, none; cremaster-reflex, right, none; cremaster-reflex, left, none.

No. 2, æt. 42.—Seven years' standing. Tendon-reflex, none; cremaster-reflex, right, a trace; cremaster-reflex, left, none.

No. 3, æt. 40.—Three years; mild case; slight neuralgia; no eye symptoms, or bladder troubles. Tendon-reflex, right, none; tendon-reflex, left, quite distinct; cremaster-reflex, right, a trace; cremaster-reflex, left, none.

No. 4, æt. 17.—Posterior sclerosis with rare epileptic fits. Tendon-reflex, none; cremaster-reflex, right, none; cremaster-reflex, left, good.

No. 5, æt. 38.—Rapid case, one year's duration. Tendon-reflex, none; cremaster-reflex, right, none; cremaster-reflex, left, a trace.

No. 6, æt. 38.—Posterior sclerosis of three years' duration. Tendon-reflex, none; atrophy of right testicle from mumps,

cremaster-reflex, right, good, but varies daily and is easily exhausted; cremaster-reflex, left, none; no left testicle, but well seen in the belly-region of cremaster on tickling thigh.

No. 7, æt. 48.—Six years' duration. Tendon-reflex and cremaster-reflex absent.

No. 8, æt. 42.—Early stage. Tendon-reflex, none; cremaster-reflex, right, good; cremaster-reflex, left, perfect.

No. 9, Mr. N., æt. 35.—Commencing locomotor ataxia. Stands well, eyes shut; tendon-reflex, none; cremaster-reflex, right, is slight; cremaster-reflex, left, none; the left being the worst side.

No. 10, æt. 60.—Posterior sclerosis, earliest stage. Slight neuralgia; no eye symptoms; tendon-reflex absent; cremaster-reflex perfect on both sides.

Except in Cases 8 and 10 the cremaster-reflex was lessened or lost in all of the instances given, but had not the certainty of the tendon-reflex, which was lost in all cases save one, and in that was absent in one leg.*

In a case of dementia paralytica, æt. 30, the tendon-reflex was utterly gone; cremaster-reflex was good, but not perfect.

In a case of acute paralysis of the adult, limited to the right leg and quite complete, the tendon-reflex on right was absent; *good* on left; cremaster-reflex, right, good; cremaster-reflex, left, fair.

It is clear enough, from what I have here said, that the extreme uncertainty of the cremaster-reflex in healthy adults, its variability, as well as its normal irregularities, such as double-reflex, and single crossed reflex, make it of little value in symptomatology—a conclusion re-enforced by all that I have seen of it in disease.

In ataxia it is not lost as is tendon-reflex, nor in spastic spinal paralysis is it increased. In hemiplegias its history is curious rather than useful, and my conclusion is, that cremaster-reflex has as yet little or no value in symptomatology. The

* The tendon-reflex has been examined with care at my clinic, and in my private practice in a far larger number of cases, and may, I think, be regarded as one of the most sure, and also one of the earliest signs of uncomplicated posterior sclerosis.

Case 3, of this series, is the only ataxic I have seen who had any remnant of tendon-reflex.

frequency of crossed reflex in hemiplegia is very interesting, as well as the fact of the area for double excitation being usually on the left side. Except in extreme cases of infantile palsy the cremaster-reflex does not seem to be disturbed, but in the graver examples of general loss of power in a limb, the cremaster-reflex appears to be absent or weakened on both sides. A larger experience is needed as to this point, since my attention having been but lately given to it I have here noted only five cases.

Jastrowsky expresses his surprise that a reflex arc, which is presumed to complete itself in the lumbar cord, should be broken by cerebral disease causing hemiplegia. I had myself made a like reflection before reading the abstract of his paper, and I yet find difficulty in comprehending that, while the plantar-reflex should be exaggerated, the cremaster-reflex should be lessened or lost.

To suppose that it alone of all reflex phenomena should be diminished by removal of cerebral influence seems to me so inconceivable, that I would prefer to believe that the cremaster-reflex track is completed in the brain—a somewhat violent supposition, but without which these anomalous phenomena seem to be incomprehensible.

ART. II.—TEA DRINKERS' DISORDER, OR TOXIC EFFECTS OF TEA.

BY W. J. MORTON, M. D., NEW YORK.

A CASE occurring in practice lately drew my attention to a special train of symptoms associated with the excessive use of tea, meaning by this term the ordinary infusion of tea leaves (*Thea sinensis*), drank daily at our tables.

Around the details of this single case, other data pointing in the same direction, accumulated. One of the most interesting, perhaps, of these was the fact that there exists in New York, as well as in many other parts of the world, a *class* of people which suffers from what would seem to be a specific